Citation:

McCann SE, McCann WE, Hong CC, Marshall JR, Edge SB, Trevisan M, Muti P, Freudenheim JL. Dietary patterns related to glycemic index and load and risk of premenopausal and postmenopausal breast cancer in the Western New York Exposure and Breast Cancer Study. *Am J Clin Nutr*. 2007; 86 (2): 465-471.

PubMed ID: 17684220

Study Design:

Case Control Study

Class:

C - Click here for explanation of classification scheme.

Research Design and Implementation Rating:

POSITIVE: See Research Design and Implementation Criteria Checklist below.

Research Purpose:

To estimate breast cancer risk as a function of glycemic index (GI) and glycemic load (GL) using both reduced rank regression-derived dietary patterns to predict GI and glycemic load GL, and simple GI and GL estimates.

Inclusion Criteria:

Case

- Female
- Age 35-79 years
- Incident, primary, histologically-confirmed breast cancer
- Living in New York State.

Control

- Female
- Age 39-79 years
- No history of cancer other than non-melanoma skin cancer
- Living in New York State.

Exclusion Criteria:

Not specified.

Description of Study Protocol:

Recruitment

- Cases were determined as part of the Western New York Exposure and Breast Cancer Study (WEB)
- Controls were randomly selected from either the New York State Department of Motor Vehicles drivers' license list (participants under 65 years) or from the Health Care Finance Administration rolls (participants age 65 years and older).

Design

Case-control study.

Dietary Intake/Dietary Assessment Methodology

OFF to determine diet 12-24 months before breast cancer diagnosis (cases) or interview (controls).

Blinding Used

Not described.

Intervention

Not applicable.

Statistical Analysis

- Cases and controls were matched by age, race and county of residence
- Dietary patterns for GI, GL, and GI and GL together were derived using reduced rank regression (RRR) with OFF use data as the predictor in all models
- Statistical analysis for breast cancer risk was stratified by
    - Menopausal status
    - Menopausal status and BMI
- Unconditional logistic regression was used to estimate the association between breast cancer and GI, GL and scores for dietary patterns
- Continuous indexes for GI, GL or dietary patterns were categorized into quartiles based on the menopause-specific control group
- Models were adjusted for control variables listed below.

Data Collection Summary:

Timing of Measurements

- Data for cases was collected from 1996-2001
- Data were collected for each participant at a single time point (not longitudinal).

1. Dependent Variables

Dietary GI and GL patterns: Calculated using reduced rank regression with food use from food-frequency questionnaire [from FFQ)] as predictor variables. Foods were grouped by nutrient content and use.

1. Independent Variables

Food use: determined by FFQ with nutrient intake computed with DIETSYS software.

2. Dependent Variables

Breast cancer: Determined based on physician diagnosis with histological confirmation

2. Independent Variables

- Dietary GI: Calculated by dividing dietary GL by total carbohydrate intake
- Dietary GL: Calculated as the product of each food specific GI (determined using published values), frequency of that food's use and carbohydrate content summed across all foods
- Dietary GI and GL patterns: Calculated using reduced rank regression with food use (from FFQ) as predictor variables. Foods were grouped by nutrient content and use.

Control Variables

- Age
- Education
- Race
- BMI
- Age at menarche
- Age at first birth
- Parity
- History of benign breast cancer
- Total energy intake
- Age at menopause (if applicable).

These variables were gathered by in-person interview.

Description of Actual Data Sample:

- *Initial N:*
  - Cases: N=1,166
  - Controls N=2,105 (All female)
- *Attrition (final N):*
- *Age:* 35-79 years
- *Ethnicity:* Predominantly white (90%)
- *Other relevant demographics:* None
- *Anthropometrics:* Not reported
- *Location:* New York State.

Summary of Results:

Findings

- Dietary patterns predicting 34% of variance in GI and 68% of variance in GL consisted primarily of sweets, refined grains, salty snacks and added fats
- In premenopausal women, breast cancer was not related to GI, GL or any patterns derived from these indexes
- In postmenopausal women, there was a decrease in risk of breast cancer in the highest vs. lowest quartile of the first dietary pattern predicting GI and GL simultaneously (OR 0.68; P=0.03; 95% CI: 0.50 to 0.93)
- In premenopausal women with a BMI greater than or equal to 25kg/m^2, there was an

increase risk of breast cancer associated with the highest vs. lowest quartile of GL-related food patterns (OR: 2.21; 95% CI: 1.04, 4.69), however, the overall effect of GL-related food pattern was not statistically significant in the model (P=0.08)
- In postmenopausal women with a BMI greater than or equal to 25kg/m^2, there was a decrease in risk in the highest vs. lowest quartile of GL (OR: 0.63; P =0.01; 95% CI: 0.42, 0.94)
- In postmenopausal women with a BMI greater than or equal to 25kg/m^2, there was a decrease in risk in the highest vs. lowest first dietary pattern predicting GI and GL simultaneously (OR 0.64; P=0.05; 95%CI 0.44 to 0.93).

Author Conclusion:

Although RRR may be useful in studies of diet and disease, our results suggest that RRR dietary patterns based on GI and GL provide similar information regarding the association between breast cancer, GI and GL.

Reviewer Comments:

- *Recruitment for WEB study not detailed*
- *It is not clear how the selection method for the control groups may have influenced the study*
- *It is also not clear if the control participants under 65 years were similar to the participants over 65 years, who were recruited differently*
- *There is no report of data attrition*
- *A comparison of study characteristics for case and controls, including co-morbid conditions that may be relevant to cancer risk, were not described*
- *Analyses did not control for physical activity*
- *FFQ data may be biased generally, but the biases in reporting may differ somewhat in the cases vs. the controls.*

Research Design and Implementation Criteria Checklist: Primary Research

Relevance Questions

1.	Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies)	Yes
2.	Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	Yes
3.	Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice?	Yes
4.	Is the intervention or procedure feasible? (NA for some epidemiological studies)	Yes

Validity Questions

1.	**Was the research question clearly stated?**	Yes
1.1.	Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified?	Yes
1.2.	Was (were) the outcome(s) [dependent variable(s)] clearly indicated?	Yes
1.3.	Were the target population and setting specified?	Yes
2.	**Was the selection of study subjects/patients free from bias?**	Yes
2.1.	Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	Yes
2.2.	Were criteria applied equally to all study groups?	Yes
2.3.	Were health, demographics, and other characteristics of subjects described?	Yes
2.4.	Were the subjects/patients a representative sample of the relevant population?	Yes
3.	**Were study groups comparable?**	Yes
3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	N/A
3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	N/A
3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	N/A
3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	N/A
3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	Yes
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
4.	**Was method of handling withdrawals described?**	Yes
4.1.	Were follow-up methods described and the same for all groups?	N/A
4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	N/A

4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	N/A
4.4.	Were reasons for withdrawals similar across groups?	N/A
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A
5.	**Was blinding used to prevent introduction of bias?**	Yes
5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	N/A
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	???
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	N/A
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	Yes
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A
6.	**Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were interveningfactors described?**	Yes
6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	N/A
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	N/A
6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	Yes
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	Yes
6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	N/A
6.6.	Were extra or unplanned treatments described?	N/A
6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	Yes
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
7.	**Were outcomes clearly defined and the measurements valid and reliable?**	Yes
7.1.	Were primary and secondary endpoints described and relevant to the question?	Yes
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	Yes

7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	N/A
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	Yes
7.5.	Was the measurement of effect at an appropriate level of precision?	Yes
7.6.	Were other factors accounted for (measured) that could affect outcomes?	Yes
7.7.	Were the measurements conducted consistently across groups?	Yes
8.	**Was the statistical analysis appropriate for the study design and type of outcome indicators?**	Yes
8.1.	Were statistical analyses adequately described and the results reported appropriately?	Yes
8.2.	Were correct statistical tests used and assumptions of test not violated?	Yes
8.3.	Were statistics reported with levels of significance and/or confidence intervals?	Yes
8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	N/A
8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	Yes
8.6.	Was clinical significance as well as statistical significance reported?	Yes
8.7.	If negative findings, was a power calculation reported to address type 2 error?	N/A
9.	**Are conclusions supported by results with biases and limitations taken into consideration?**	Yes
9.1.	Is there a discussion of findings?	Yes
9.2.	Are biases and study limitations identified and discussed?	Yes
10.	**Is bias due to study's funding or sponsorship unlikely?**	Yes
10.1.	Were sources of funding and investigators' affiliations described?	Yes
10.2.	Was the study free from apparent conflict of interest?	Yes